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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/789,074

02/27/2004

Dennis S. Greywall

34

7287

7590 01/24/2007
Docket Administrator (Room 3J-219)
Lucent Technologies Inc.
101 Crawfords Corner Road
Holmdel, NJ 07733-3030

EXAMINER

LAZORCIK, JASON L

ART UNIT

PAPER NUMBER

1731

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
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3 MONTHS

01/24/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/789,074

Applicant(s)

GREYWALL, DENNIS S.

Examiner

Jason L. Lazorcik

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 27 February 2004 and 03 January 2007.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-22, 26-28, 40 and 41 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-22, 26-28, and 40-41 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date _____
- ☐ Notice of Informal Patent Application
- ☐ Other: _____

DETAILED ACTION

Election/Restrictions

Applicant's election with traverse of a method of aligning carbon particles in the reply filed on January 3, 2007 is acknowledged. The traversal is on the ground(s) that the process of injection molding could not have resulted in a carbon fiber according to the presently claimed structure. This is not found persuasive because Applicants argument does not point out all of the supposed errors in the restriction requirement.

Specifically, MPEP 803 states:

"For purposes of the initial requirement, a serious burden on the examiner may be prima facie shown if the examiner shows by appropriate explanation of separate classification, or separate status in the art, or a different field of search as defined in MPEP § 808.02.

In light of the above, it is the Examiners position that no convincing argument has been set forth to invalidate the use of injection molding as a means to fabricate the claimed product. Further, Applicants arguments do not overcome the fact that the claimed inventions have found different status in the Art as evidenced by a different classification for each of said claimed inventions. For at least these reasons, an examination of the application as presented would necessitate divergent fields of search and would therefore constitute a serious burden upon the Office

The requirement is still deemed proper and is therefore made FINAL.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1,3,6, 8, 9,10,12, 13,14,15, 16, 17, 18 19, 20, 21, 26, 28 and 40 are rejected under 35 U.S.C. 102(b) as being anticipated by Roeder (DE 3,516,920 – *Note rejections are based upon the machine translation*). Support for the following rejection can be found in the accompanying machine translation sections ([P1, L1-13]; [P1, L18 to P2, L7]; [P2, L41-65]; [P3, L26-40]; [P4, L38-42]; [P5, L42 to P6, L6])

- 1) The reference teaches producing a composite article comprising glass and carbon particles or “carbon fibrils” (**Claim 3**) “whose core zone is unidirectionally strengthened with continuous fibers”. These fibers are “oriented by the structure...to the longitudinal axis of the semi-finished material” or substantially aligned (**Claim 26, 28, 40**)
- 2) The disclosed process is characterized by “impregnating (a carbon fiber) bundle to form a “glass containing carbon particles” (Claim 8) and it teaches that this body may be fabricated in accord with the “Sol-Gel” process (**Claim 9, 10**). During the process, the body may be imbued with an alcohol in addition to the glass powder or “at least one other

material" (**Claim 13**). The reference teaches that this preform may be of low density (e.g. porous) and that it is advantageous to "consolidate the impregnated preform before (extruding the composite article)" (**Claims 12, 14**)

- 3) The composite article is formed from the heated preform by "a combined extruding and pulling through procedure" (**Claim 6**). As taught in the instant reference, the preform body is incorporated into a larger body which is made at least in part of glass and which has a hole and at least one other body (**Claims 15, 16, 18**). Upon the disclosed heating, the preform and glass body are "consolidated" (**Claim 17**), and by the extruding and pulling procedure, at least some of the glass is removed from the exterior portion of the carbon fiber by a mechanical process (**Claims 19, 20, 21**).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

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1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 4,5, and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Roeder and the general teachings of Hearle et al. (as presented by Zhang et. al., Science v306, no. 5700, (2004), pp 1358-1361)). The Roeder reference is silent regarding the performance of a twisting operation upon the fiber in the heated state. Zhang relates the following with reference to Hearle;

“a generic equation (9) provides useful insights for spinning nanotube yarns. Specifically, the ratio of yarn tensile strength (σ_y) to the tensile strength of the component fibers (σ_f) is approximately

$$\sigma_y/\sigma_f \approx \cos^2 \alpha [1 - (k \operatorname{cosec} \alpha)] \quad (1)$$

where $k = (dQ/\mu)^{1/2}/3L$, α is the helix angle that fibers make with the yarn axis, d is the fiber diameter, μ is the friction coefficient between fibers, L is the fiber length, and Q is the fiber migration length (i.e., the distance along the yarn over which a fiber shifts from the yarn surface to the deep interior and back again).

The $\cos^2 \alpha$ term in Eq. 1 describes the strength decrease of a twisted assembly of continuous fibers, which occurs because the fibers in the twisted yarn are inclined at the angle α with respect to the tensile axis. For short fibers, however, in the absence of twist there is little strength because there are no significant transverse forces to bind the fiber assembly together. The $[1 - (k \operatorname{cosec} \alpha)]$ term describes the generation of transverse forces by transfer of the tensile load to the yarn surface, which locks the fibers together as a coherent structure. The components of k show that the strength obtainable for a given level of twist increases with increasing coefficient of friction and fiber length and with decreasing fiber diameter and fiber migration length.

Effectively, Hearle teaches that twisting a fiber greatly increases the tensional rupture strength of the produced fiber over non-twisted fibers. It would have been obvious for one of ordinary skill in the art at the time of the invention with the Roeder

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and Hearle teachings in hand to twist the fiber as produced according to the Roeder method. This would have been an obvious modification to anyone seeking to increase the strength of the fiber.

Claims 22 is rejected under 35 USC 103(a) as being obvious over Roeder (DE 3,516,920) as applied to Claim 19 under §35 USC 102(b) above. Roeder is silent regarding the use of a chemical process to remove at least a portion of the exterior glass from the carbon fiber. That said, the literature is replete with "chemical processes" (e.g. hydrogen fluoride) which provide a controlled etch of glass from a substrate. One familiar with the Art would reasonably be expected to recognize the impact of the thickness of an exterior coating upon the physical properties of the produced fiber. It would have been obvious for one of ordinary skill in the art at the time of the invention to utilize a "chemical process" to remove a portion of this external coating in order to achieve the desired thickness in the exterior glass layer of the as produced carbon fiber. The chemical removal of a portion of the exterior glass layer would have been an obvious approach to tailor the physical properties of the produced fiber by thinning the exterior glass coating.

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Roeder as applied to Claim 9 under 35 USC 102(b) and in further view of Chandross (US 5,240,488). Roeder is silent regarding the addition of an ester to the carbon particle/ sol gel mixture as set forth in the instant claim. Chandross Claim 4 teaches that "the pH-decreasing ingredient is added to the sol prior to introduction of the sol into the mold, and in which the pH-decreasing ingredient consists essentially of an ester whereby the

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rate of gelation is controlled". It would have been obvious to one of ordinary skill in the art being aware of the Chandross teachings to add an ester to a sol-gel mixture in order to control the rate of gelation of the sol. Where the rapid gelation of the sol in the Roeder process may lead to an unsuitably heterogeneous carbon particle preform, the addition of an ester would have been an obvious modification to the sol for one seeking to prolong the infusion period by extending the gelation time period.

Claims 2, 27, and 41 are rejected under 35 U.S.C. 103(a) as being unpatentable over Roeder as applied under 35 USC 102(b) to claim 1, 26, and 40, respectively in further view of Kumar (Macromolecules 2002, 35, 9039-9043). Roeder is silent regarding the use of carbon nanotubes as the carbon particles in the disclosed method for assembling carbon particles. Kumar recites multiple previous studies which confirm the "benefits of reinforcing polymer and other matrices with carbon nanotubes". The instant reference figure 4, 5, and 6 point to beneficial advantages in the composite structures including a reduced thermal shrinkage, reduced weight loss with temperature, and an enhanced creep behavior at elevated temperature for the composite over virgin matrix material. It would have been obvious for one of ordinary skill in the art at the time of the invention, being aware of the confirmed benefits of reinforcing a matrix with carbon nanotubes, to substitute said nanotubes for the disclosed carbon fibers in the Roeder invention.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jason L. Lazorcik whose telephone number is (571)

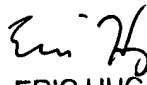
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272-2217. The examiner can normally be reached on Monday through Friday 8:30 am to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Steven Griffin can be reached on (571) 272-1189. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JLL


ERIC HUG
PRIMARY EXAMINER